

Rapid Deployment Flood Control System

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673,62.18,645,646

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BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates broadly to methods for preventing or inhibiting the flow of water and other fluids, including oily water or toxic chemicals. In a preferred aspect, the invention relates to flood control systems, and more preferably to mobile flood control systems.

2. Description of the Related Art

Flood control systems may be classified as either stationary or mobile. One common type of stationary flood control system is a fixed, concrete dam. An early effort at improving stationary dams is disclosed in U.S. Pat. No. 1,077,791, disclosing a concrete dam structure having a "honeycomb" construction, with individual cells that may be either empty or filled with water. Another common and relatively inexpensive stationary flood control system is an earthen levee.

One of the disadvantages with stationary flood control systems is the amount of time needed build them. Another disadvantage is the high cost to engineer them. Another disadvantage is the high cost to construct them. Another disadvantage is a tremendous amount land that is required and the destruction of valuable historic and ecological treasures. Another disadvantage is that the dam is fixed in a permanent location and the designed capacity that may be inadequate because the amount and rate runoff is greater than anticipated. Dams are now understood to have and adverse impact upon the environment. Yet this does not negate the fact that a viable means for flood control is needed in place of these systems hence the need for this device.

For mobile flood control, sandbags have been and are still the most well-known and widely used technique. During flooding, sandbags are typically placed by human hands at locations that are still above the rising water level, to collectively create a wall, dam, or

barrier against the floodwaters. Sandbags, however, have a number of logistical problems and disadvantages.

One of the problems with sandbags lies in the amount of human labor required for their installation. Each bag must be filled, usually by hand, and then placed at the location where the barrier is being constructed. Another problem is obtaining and transporting sufficient quantities of sand for filling purposes, which is often very expensive and time-consuming. Another problem is the logistics of coordinating the human effort of filling the bags and placing the bags at the right location within the appropriate time frame.

Several attempts have been tried to improve the use and deployment of sand by employing machines to fill bags or structural partitions. Even with machinery the use of sand to control flooding is a very daunting and often impossible task due to the sheer number of sandbags that must be placed. When machinery is used the labor must be highly skilled and well trained to avoid injury and death.

Another problem that can make the use of sandbags more difficult is the fact that sandbags must often be placed in pouring rain creating safety hazards. Still another problem is that the placement of the bags must be done in a precise manner otherwise instability will be created. Another problem is that plastic sheeting or netting is often needed to prevent seepage and weakening of the dam. Another problem is that the sandbag dam requires constant monitoring and maintenance to prevent a breakthrough resulting in failure.

Still another problem is that after flooding, once the waters have subsided, the sandbags must be removed, either in a filled condition, or else emptied of their contents at the location.

As a result other approaches have been suggested and tried as a substitute for sandbags. Many of these other approaches rely on water or fluid (instead of sand) placed inside tubes or other structures to provide the weight needed to resist the hydrostatic forces of rising water. Such systems are exemplified in the "Water-Bag Dam or Dike and Method," disclosed in Jackson III, U.S. Pat. No. 4,692,060; in the "Portable Highway Barrier" disclosed by Chiodo, U.S. Patent 4,869,617; in the "Barrier For Containing Floods," disclosed in Coffey, U.S. Patent 4,921,373; in the "Device for Controlling Flood Waters and/or Hazardous Liquid Spills," disclosed in Hendrix, U.S. Pat. No. 5,040,919; in the "Apparatus and a Method for Joining Water Structure Sections or the Like," disclosed in Doolaege, U.S. Pat. No. 5,059,065; in the "Wall-Like Retainer Segments for Retaining Fluids," disclosed in Baker, U.S. Pat. No. 5,632,5723; and in the "Flood Control System," disclosed in Perry, et. al, U.S. Patent 6,012,872; and in the "Flood Control Barrier," disclosed in Dery, U.S. Pat. 6,551,025; and in the "Water Filled Membrane Dike," disclosed in Clement, U. S. Pat. 6,641,329.

These systems can be rather complex to use. For example in Clements, U.S. Pat. No. 6,641,329, the "Water Filled Membrane Dike" involves a complicated system of elongated, inflatable round bladders. At least one of the shortcomings of the above systems is that they are difficult to install and fill quickly. Further, some are incapable of

providing resistance to flood waters unless they are filled with water. In addition they lack the structural strength of rigid structures or containers.

Some systems rely on the use of individual "water bags" or other plastic, flexible water-filled articles of various sizes. These water bags serve essentially as replacements for sandbags. These are exemplified by the "Flood Disaster Control Bag," in Wagner et al., U.S. Pat. No. 4,362,433; the "Water Filled Plastic Dam Structure," in Serota, U.S. Pat. No. 3,213,628; the "Hovering Bag Breakwater," in Weigel et al., U.S. Pat. No. 3,191,386; and in the "Method and Apparatus for Constructing Hydraulic Dams and the Like," in U.S. Pat. No. 5,125,767.

Among the many shortcomings of these "water bag" approaches is that many of them simply do not adequately overcome the time and labor problems presented by sandbags. For example, the water bags or containers in Wagner '433 and Serota '628 must be filled with water before they can provide an effective barrier to flood waters. The plastic container in Serota '628 must be filled with water even before it is positioned, since without water, in its collapsed state, it is essentially formless. Unless these containers are filled with water, they cannot be stacked nor can they even form an effective barrier.

Other systems rely on the use of a plurality of water-filled rigid containers of various shapes and sizes. The structure and materials of composition of these containers enable them to set up easier than the flexible water bag, and membrane tubular type systems. These features also enable them to provide greater resistance to the hydrostatic forces of rising water. These are exemplified by the "Portable Highway Barrier" disclosed by in Chiodo, U.S. Patent 4,869,617 and in the "Flood Control System," disclosed in Perry, et. al, U.S. Patent 6,012,872.

Among the many shortcomings of these "water-filled containers" approaches is the time needed to fill them. Another shortcoming of these and the other water filled systems is the need for a pump or other means to fill the containers from the top must be supplied by the user. Another shortcoming is the need for fuel or power to operate the pump. Another shortcoming is the inability of the containers in some of these systems to be disassembled increasing the logistics problem of transporting and depositing an adequate supply of units to build the dam.

Another shortcoming is the weight of the empty containers in some systems requires power-operated equipment to transport and position. In U.S. Patent 6,012,872 Perry, et. al. suggested using large shipping containers e.g., corrugated metal containers that are about 20 feet long, 8.5 feet high and 8 feet wide available from TransAmerica, Inc. and Sea Container, Inc. The weight of these containers requires heavy lifting equipment with skilled operators to deposit them at the desired location. The weight of the containers and the use of the lifting equipment increase the risk of injury and death for those who assist with the deposition of the containers. These factors increase the logistics and cost of using these systems.

Another shortcoming is the complexity of providing an adequate means of stability against tipping over in some of these systems. For example in U.S. Patent 6,012,872

Perry, et. al. suggested using the anchoring members of concrete structures embedded into the surface. The use of this anchoring means limits the locations where the systems can be placed.

Due to changes in land development and rain patterns the flooding patterns will and often do change requiring the flood control system being utilized to be more adaptable and flexible than the present stationary and mobile flood control systems. The need for an improved anchoring means of mobile flood control systems is seen as a means of making mobile water filled flood control systems more reliable, adaptable and flexible. Also a means of utilizing containers that can be transported unassembled, quickly and easily assembled into rigid containers, and the reassembled empty containers can quickly and easily deposited onto and attached to the bases. Also the flood control system will have a means of having the empty containers be self-filling with floodwater. Accordingly, as discussed in greater detail below, the present invention provides a much-improved approach to flood control, overcoming one or more of the above shortcomings of earlier systems.

SUMMARY OF INVENTION

In a broad aspect, the invention is directed to a flood control method and apparatus. In a specific aspect, the method involves: (a) providing a plurality of bases with anchoring members; (b) positioning the plurality of bases at a selected location proximate to a body of water, the bases being positioned at the selected location in an abutting relationship; (c) anchoring the bases to the surface, the base having a metal frame constructed of a pair of parallel metal angle portions, parallel metal strips positioned in between the metal angle, and a second pair of parallel metal angle portions disposed at right angles to first pair of parallel metal angles operably connecting the first pair of parallel metal angles and parallel metal strips; (d) anchoring members deposited through the first pair of parallel metal angles and parallel metal strips; (e) attaching a plurality of containers to the bases, the containers being attached in an abutting relationship; (f) and the bases and containers form a barrier. Preferably, as discussed in greater detail below, the containers are constructed of a bottom panel and the bottom panel is constructed of sections of plastic pipe with metal strips, a pair of parallel end panels and the end panels are constructed of sections of plastic pipe with metal strips, and a pair of parallel sidewalls and the sidewalls are constructed of sections of plastic pipe with a pair of metal frames wherein the sidewalls are operably connecting the bottom panel and pair of end panels.

In a more specific aspect, the flood control method includes the steps of: (a) identifying a flood zone area prior to flooding, the flood zone area being proximate to a body of water, the body of water being susceptible to flooding whereby the top surface of the body of water rises and the water flows into, and onto, the flood zone area; (b) identifying a flood barrier protection area proximate to the flood zone area; (c) providing a substantially level support surface within the flood protection barrier area; (d) providing a plurality of bases; (e) positioning the bases adjacent to one another in an abutting relationship on the substantially level support surface within the flood barrier protection area; (f) inserting anchoring members through the bases and depositing them into the surface; (g) providing

a plurality of containers, the containers having a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls operably connecting the bottom panel and parallel end panels; (g) attaching of the containers in an empty state to the bases with anchoring members adjacent to one another in an abutting relationship to form a barrier to flooding; and (h) attaching at least one of the containers to an adjacent container.

In another aspect of the invention, the flood control method includes the steps of: (a) providing a first base with anchoring members and a skirt, the skirt being substantially impervious to water, and having at least one fixed edge, which is connected to the first base, and at least one free edge, which is unconnected to the first base; (b) placing the first base with anchoring members adjacent to a second base in an abutting relationship proximate to a body of water that is susceptible to flooding by a rising water level, (c) attaching of some of the containers in an empty state to the bases with anchoring members on top of the skirt connected to the bases, (d) attaching of some of the containers in an empty state adjacent to one another in an abutting relationship to form a barrier to flooding, wherein a ground surface is located between the base, the containers and the body of water; and (e) depositing at least a portion of the free edge of the skirt over at least a portion of the ground surface between the body of water and the barrier formed by the first and second bases and attached containers.

Another aspect of the invention relates to a flood control apparatus, which preferably includes: (a) at least two adjacent bases in an abutting relationship; (b) with anchoring members inserted through the bases deposited into the surface (c) at least two adjacent containers in an abutting relationship, each of the at least two containers having a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls operably connecting the bottom panel and parallel end panels, defining a receptacle for receiving water; and (d) a means for preventing floodwater from passing between the bases and containers.

Another aspect of the invention relates to a flood control apparatus, which preferably includes: (a) at least two adjacent bases in an abutting relationship; (b) with anchoring members inserted through the bases deposited into the surface (c) at least two adjacent containers in an abutting relationship, each of the at least two containers having a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls operably connecting the bottom panel and parallel end panels, defining a receptacle for receiving water; and (d) a means for preventing floodwater from passing between the containers.

In still another specific embodiment, the flood control apparatus includes a plurality of rigid containers, each of the containers including at least an outer housing which is constructed of plastic pipe and a pair of metal frames and which is capable of being disassembled, being moved from location to location, being reassembled, being attached to the bases in a selected location, and being attached to a second, adjacent movable outer housing by two or more fasteners, the first outer housing having a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls, the housing also having a pair of parallel sidewalls made of plastic pipe and metal frame and operably connecting the bottom panel and a pair of parallel end panels, wherein the plurality of containers are attached to the anchored bases positioned in a selected location on a substantially

horizontal surface in or proximate to a flood zone area, the containers are attached to anchored bases and being placed end-to-end to form a barrier, and the plurality of containers being attached to anchored bases and being positioned above the water level of the body of water.

In yet another specific embodiment, a flood control apparatus of this invention includes (a) an outer container having a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls operably connecting the bottom panel and parallel end panels; (b) an inner flexible container wherein the flexible container is a bladder constructed of plastic membrane which is disposed inside the outer container, the bladder having an opening for introducing water into the bladder; (c) a pipe inserted through the one of the bottom corners of the front sidewalls of the outer housing; (d) the pipe being sealed between the pipe and juncture with the front sidewall; (e) the opening of the flexible container being attached to the end of the pipe inside the outer container; (f) a detachable one way flow valve being connected to other end of the pipe outside the outer container (g) the one way flow valve allows water to flow into the flexible container; and (h) a second pipe being inserted through of the top corner of the sidewall of the outer housing; (i) the pipe being sealed between the pipe and juncture with the front sidewall; (j) a detachable one way flow valve being connected to end of the pipe outside the outer container (k) the one way flow valve allows air to flow out from the outer housing as the flexible container fills with water.

Another specific embodiment of the apparatus, which is preferred, particularly where the contours of the flooding zone are uneven, or where there are natural obstacles proximate to the body of water such as trees and the like, is a flood control apparatus that includes: (a) at least two bases with anchoring members positioned at right angle (90°) to each other along their edges; (b) attaching at least two containers with outer housings with a bottom panel, a pair of parallel end panels and a pair of parallel sidewalls, operably connecting the bottom panel and a pair of parallel end panels to the bases; (c) a 90° metal angle bracket covered by a sheet of rubber; (d) a 90° metal angle bracket covered by a sheet of rubber operably connecting the bases and containers at the right angle juncture of the edges to the bases and containers; (e) at least two metal bars having 45° bent ends; and (f) at least two metal bars having 45° bent ends operably connecting the other edges of the containers.

The rigid bottom panel may include two or more integral reinforcing metal strips for providing horizontal alignment to bottom panel, the end panels may include two or more integral reinforcing metal strips for providing vertical alignment to the end panels and the sidewalls may include one or more integral reinforcing metal strips for providing vertical alignment to the sidewalls.

A specific embodiment of this invention, which is preferred, is to provide a container that is (a) easily disassembled for storage and easy transport; (b) easily and quickly assemble into a sturdy, reliable and reusable container; (c) includes an outer housing constructed of plastic pipe, metal strips and metal frames; (d) the container being capable of being moved from location to location, of being attached to a base anchored to the surface by

two or more fasteners in a selected location, and of being attached to a second, adjacent outer housing by two or more fasteners.

The flood control method also includes the step of the containers self-filling with water as the level of the floodwater rises to provide sufficient weight to the containers to enhance the anchoring means of the bases to resist the hydrostatic forces of rising water.

Further, the flood control method should include the step of attaching a flexible container to the rigid containers, then allowing the flood water to fill the inside of the flexible container as the flood water rises outside the rigid container. These flexible containers should be expandable bladders made of a material such as plastic, with an opening to receive water. In using the flexible container with the flood control method, the water can be removed from the flexible container by detaching the one way flow valves from both the water inlet pipe attached to the flexible container and the air vent pipe, e.g., after flooding situation has abated and prior to disassembling and removing the containers from a flood barrier protection area.

The flood control method also includes the step of connecting one or more of the plurality of rigid containers to other containers. Further, where at least two of the rigid containers are adjacent to one another, a rubber gasket is sealed to the outer edges of the metal frames of the sidewalls and bases. The bases and the metal frames are tightened together by the fasteners to form a liquid tight seal. The use of foam and plastic sheeting as suggested by Perry, et. al. produces a less durable seal and can be damaged or deformed preventing the seal from occurring. The damaged foam and plastic sheeting become waste that must be disposed of and replaced increasing the cost of use of the flood control system. If the foam or plastic sheeting supplies run out the integrity of the system is compromised.

The flood control method also includes the step depositing the bases in an abutting relationship upon the surface. The flood control method also includes anchoring members being inserted through the bases and being deposited into the surface creating a foundation that hold the bases in a fixed stable position. The flood control method also includes the foundation being embedded into the surface. The flood control method also includes attaching the rigid containers to the anchored bases. In addition, the method includes the step of stacking containers on top of other containers attached to the bases.

Further, wherein a skirt is connected to the base, and an air space is formed between the first and second bases it is preferred that at least a portion of the free edge of the skirt covers the air space. In addition, where a skirt is used, it is preferred that at least a portion of the skirt attached to one base overlaps at least a portion of another base.

Where a skirt is used as part of the flood control method, at least a portion of the free edge of the skirt will be held down by a pair of parallel rows of pipe held down by sand and water filled containers deposited on top of the row plastic pipes. The pipe and container system being lighter and quicker to install than metal bars as suggested by Perry et. Al.

Brief Description of Several Viewing Of Drawings

Figure 1 Side View Of Double Stacked Units

Figure 2 Front View Of Double Stacked Multiple Units

Figure 3 Three Dimensional View of Unit

Figure 4 Side View Of Anchored Double Stacked Units

Figure 5 Front View Of Anchored Double Stacked Multiple Units

Figure 6 Three Dimensional View of Anchored Unit

Figure 7 Overhead View Of Base

Figure 8 Front View Of Base

Figure 9 Cross Sectional Front View Of Base

Figure 10 Cross Sectional Side View Of Base

Figure 11 Front View Of Front Side Wall

Figure 12 Rear View of Front Sidewall

Figure 13 Outside View of Back Sidewall

Figure 14 Inside View of Back Sidewall

Figure 15 Side View of Front Sidewall

Figure 16 Side View of End Panel

Figure 17 Side View of Rear Sidewall

Figure 18 Erected Cross Sectional View Of End Panels And Bottom Panel

Figure 19 Cross Sectional View Of End Panels And Bottom Panel Folded Into Shipping and Storage Position

Figure 20 Cross Sectional View Of Bottom Panel And Top View of End Panels Packed For Shipping and Storage

Figure 21 Unfolded Cross Sectional View Of End Panels And Bottom Panel

Figure 22 Overhead View Of Unfolded End Panels And Bottom Panel

Figure 23 Bottom View Of Unfolded End Panels And Bottom Panel

Figure 24 Cross Sectional Side View Of Anchored Double Stacked Units With Empty Bladders

Figure 25 Cross Sectional View Of Anchored Double Stacked Units Water Filled Bladders

Figure 23 Overhead View of Empty Anchored Joined Units With Skirt

Figure 24 Overhead View of Anchored Joined Units With Water Filled Bladders With Skirt Attachment

Figure 25 Overhead View of Enclosed Area Protected By Installed Emergency Flood Control System

Figure 26 Overhead View Of Empty Joined Units With Skirt

Figure 27 Flood Control Channel

Figure 28 Protected Enclosed Area

Figure 29 Overhead View of Joined Units At 90° Angle

Figure 30 Front View Anchored Flood Control System Joined At Right Angle

Figure 31 Overhead View Of An Overhead Storage Tank

Description

DETAILED DESCRIPTION AND SPECIFIC EMBODIMENTS

As mentioned above, the invention is preferably directed to flood control systems. Both methods and apparatus for flood control are within the scope of the invention. We will now describe specific embodiments, examples and versions of the invention, for the purpose of enabling others skilled in the art to make and use our invention. It is understood, however, that the invention is not limited to these specific embodiments, examples and versions. Nor is the invention restricted to flood control as such, but may be used in other applications involving the forming of a barrier to prevent or restrict the flow of any liquid. Another use may be for crowd control or as a road barrier.

A person skilled in the art that has read this patent or seen the invention being used, described, or implemented will recognize many variations of the invention that might not be expressed here. Thus, it is the claims below that should be referred to for purposes of determining the scope of the invention, not only the literal elements therein, but also their substantial equivalents, including elements known to be interchangeable.

FIG. 1 is a side view of the flood control system 24 deposited onto the surface 20. The flood control system consists a bottom container 38b with a rubber gasket 32 sealed along the edges of the sidewalls deposited onto the surface 20. Also show is a second container 38a with a rubber gasket 32 sealed along the edges of the sidewalls deposited on top of the first container 38b. As shown the second container 38a is attached to the first container 38b by two or more fasteners that can not be seen in this perspective. The two containers are deposited in an abutting relationship and attached to together to form a flood control barrier 24.

FIG. 2 is a front view of the flood control system. In the particular embodiment shown in the barrier 24 is composed of four containers 38a, 38b, 38c, and 38d. (These will be referred to collectively as containers using the reference number 38 respectively.) As shown the top row of containers 38a and 38c are stacked on top of the bottom row of containers 38b and 38d. The bottom row of containers 38b and 38d are deposited on the surface 20. As will also be discussed the containers 38 are lightweight being constructed of plastic pipe, metal strips and metal frames to facilitate easy of transporting and stacking while reducing costs of transporting and handling the flood control system and risks of worker injury.

FIG. # 3 is a three dimensional view of a container 38 deposited on a surface 20.

FIG. 4 is a side view of the flood control system anchored to the surface 20. The flood control system consists a base 26 anchored to the surface 20 by anchoring members 28 a and a bottom container 38b with a rubber gasket 32 deposited on the bottom edges the sidewalls attached to the base 26. As shown the bottom container 38b is attached to the base 26 by two or more fasteners that cannot be seen in this perspective. Also show is a second container 38a deposited on top of the first container 38b. As shown the second container 38a is attached to the first container 38b by two or more fasteners that can not be seen in this perspective. The anchored base, and two containers are deposited in an abutting relationship and attached to together to form a flood control barrier 30.

As shown the anchoring members 28 are deposited into the surface at a given angle "A" to given depth "D" and width "W". As will be discussed later depositing the anchoring members to given width "W", given depth "D", and given length "L" produces a stable foundation 22 embedded into the surface having a given weight W_F the flood control system. The embedded foundation 22 produces a very stable means of preventing the flood control barrier 30 from being moved or tilted by the rising floodwater. This embedded foundation 22 also produces a very stable means of preventing the flood control barrier 30 from being moved or tilted by the flowing floodwater.

FIG. 5 is a front view of the flood control system. In the particular embodiment shown in the barrier 30 is composed of two bases 26a and 26b and anchoring members 28 and four containers 38a, 38b, 38c, and 38d. (These will be referred to collectively as bases and containers using the reference numbers 26 and 38 respectively.) As shown the top row of containers 38a and 38c are stacked on top of the bottom row of containers 38b and 38d. The bottom row of containers 38b and 38d are stacked on top of the bases 26a and 26b. The anchoring members 28 anchor the bases 26 into the surface 20. As shown the anchoring members 28 are deposited into the surface 20 to a given depth "D" for a given length "L". As shown in FIG. 4, the anchoring members 28 are deposited into the surface 20 at a given angle A to given depth "D" for a given width "W".

As will be discussed later depositing the anchoring members 28 to a given width "W", a given depth "D", and a given length "L" produces a temporarily fixed but very strong and stable foundation 22 having a predetermined size and weight W_F for the flood control system. The foundation 22 is embedded into the surface 20. As will also be discussed the containers 38 are lightweight being constructed of plastic pipe, metal strips and metal frames to facilitate easy of transporting and stacking while reducing costs of transporting and handling the flood control system and risks of worker injury.

FIG. # 6 is a three dimensional view of an anchored base 26 and attached container 38. The anchoring members 28 anchor the base 26 to the surface 20. The anchoring members 28 are metal rods, spikes or pipes of a predetermined length, size and shape. The shapes can be circular, oval, square, triangle, hollow, solid, hooked, etc. The anchoring members 28 are deposited into the surface 20 at a predetermined angle Y. The deposition of the anchoring members 28 to a given width "W", given depth "D", and given length "L" creates a foundation 22 that is embedded into the surface 20. The size or volume of the foundation 22 can be calculated ($W \times D \times L$) in cu. ft. Multiplying the size (cu. ft.) of the foundation 22 by the weight of a cu. ft. of water times the density of the surface 20 the weight W_F of the foundation can be calculated.

For example, given the width of the foundation 22 is 2 ft, the depth is 1.5 ft, and the length is 500 ft the size of the foundation is 1500 cu. ft. The weight of a cu. ft of water is approximately 63.73 pounds per cu. ft. and if the density of the surface 20 is 1.1 then the weight W_F of the foundation is equal to 1500 cu. ft. X 63.73 pounds per cu. ft. X 1.1 or 105,154.5 pounds or 52.6 tons.

This calculation shows that a 500-foot long flood control barrier 30 constructed of anchored bases 26 and rows of empty containers 38 is being held in position by a 52.6 ton foundation 22 that is embedded into the surface 20. As will be shown the weight of the flood control barrier 30 will increase as the containers 38 become filled due to the rising floodwater. As the weight of the flood control barrier 30 increases the resistance to the hydrostatic forces of the rising floodwater increases.

Figure 6 depicts the width and length of the foundation 22 being wider and longer than the base 26 because the angular deposition of the anchoring members 28. The wider and longer foundation 22 embedded into the surface 20 produces a more stable flood control system than any of the existing mobile systems. The temporarily fixed foundation 22

embedded into the surface 20 and the weight of the water filled containers 38 are a very unique means of providing resistance to the hydrostatics forces of rising floodwater for this flood control barrier system 30.

Referring now to Fig. 7, an overhead view of the base 26 for anchoring the flood control barrier 30 is shown. The particular embodiment shown in FIG. 7 is a rectangular shape base 26 composed of a pair of parallel 90° metal angle portions 26a and two or more metal strips 26b deposited in between the metal portions 26a. The ends of the metal strips 26b are attached at right angle to the pair of parallel 90° metal angle portions 26a. At the ends of the pair of parallel 90° metal angle portions 26a the ends of a second pair of parallel 90° metal angle portions 26c are attached at right angle. A predetermined number of holes 26d of a predetermined size are cut into the metal strips 26b and the pair of parallel 90° metal angle portions 26c. Screws 26e for attaching another base 26 to the first base 26 are inserted through the 90° metal angle portions 26a. A rubber gasket 26g is sealed to outer surface of the 90° metal angle portions 26a to create a watertight seal when the bases 26 are attached to one another. A third pair of parallel 90° metal angle portions 26f are attached to the second pair of parallel 90° metal angle portions 26c to provide the means for attaching the containers 38 to the bases 26 by two or more screws.

In FIG. 8 the front view of the base 26 is shown. In the particular embodiment shown a 90° metal angle portions 26g is attached in front of the 90° metal angle portions 26c. Two or more screws 26h are inserted through the 90° metal angle portions 26g. Also shown are the screws 26e for attaching another base 26 to the first base 26. The rubber gasket 26 f that is sealed to the outer surface of metal angle portion 26a is also shown.

FIG 9 is a cross sectional front view of the base 26 including anchoring members 28 along the A to A axis shown in FIG. 7. The figure shows the anchoring members 28 deposited into the surface 20 to a predetermined depth "D" through the metal strip 26 b. The figure shows the plurality of rows of anchoring members 28 that anchor the base 26 to the surface 20.

FIG 10 is a cross sectional side view of the base 26 including anchoring members 28 along the B-to-B axis shown in FIG. 7. The anchoring members 28 are deposited into the surface 20 at a predetermined angle Y producing a crisscrossing pattern. The crisscrossing pattern enhances the holding and grabbing effect of the anchoring members 28 in the surface 20 similar to the roots of a tree. Also shown is the skirt attached to the base 26.

FIG. 11 is a front view of the front sidewall 40 of the outer container 38. The front sidewall 40 is composed of sections of plastic pipe 42. PVC is the preferred material. It is a commonly used material that is readily available. Also it has great structural strength, is lightweight, and sturdy. The pipes are sealed together with a strong watertight sealant. A metal frame 44 constructed of 90° metal angle portions 46 that are attached to the outer surface of the sidewall along the edges of the plastic pipes 42. Holes 48 are cut into the sidewall at selected locations through which threaded rods 50 will be inserted. A plastic pipe 52 of a predetermined size through which water enters the container 38 is inserted through and sealed to the sidewall 40 at the bottom corner. A

plastic pipe 54 of a predetermined size through which air exits the container is inserted through and sealed to the sidewall 40 at the upper corner opposite the water inlet pipe 52.

FIG. 12 is a view of the inner surface of the front sidewall 40 of the outer container 38. Strips of rubber gasket material 56 are sealed along the edges of the sections of the pipe 42. Shown are the holes 48 cut into the sidewall at selected locations through threaded rods 50 will be inserted. Also shown is water inlet pipe 52 through which water enters the container 38 at the bottom corner. Also shown is the air outlet pipe 54 through which air exits the container at the upper corner opposite the water inlet pipe 52.

FIG. 13 is a view of the outer surface of the back sidewall 58 of the outer container 38. The back sidewall 58 is composed of sections of plastic pipe 42. The pipes are sealed together with a strong watertight sealant. A metal frame 44 constructed of 90° metal angle portions 46 is attached to the outer surface of the sidewall along the edges of the plastic pipes 42. Holes 48 are cut into the sidewall at selected locations through which threaded rods 50 will be inserted.

FIG. 14 is a view of the inner surface of the back sidewall 58 of the outer container 38. Strips of rubber gasket material 56 are sealed along the edges of the sections of the pipe 42. Shown are the holes 48 cut into the sidewall at selected locations through threaded rods 50 will be inserted

FIG. 15 is a side view of the front sidewall component 40 of the outer container 38. The front sidewall component 40 is composed of sections of plastic pipe 42 shown in vertical alignment. Strips of rubber gasket material 52 are sealed along the edges of the sections of the pipe 42. A metal frame 44 constructed of 90° metal angle portions 46 is attached to the outer surface of the sidewall along the edges of the plastic pipes 42. Holes 60 are cut into the frame 44 at selected locations through which screws 62 will be inserted. Also shown are the water inlet pipe 52 and air vent pipe 54. Also shown are the washers 64 and nuts 66 that provide the means by which the rods 50 connect the sidewalls 40 and 58.

FIG. 16 is a view of the outer surface of one of the end panels 68. Two or more metal strips 70 are sealed to the sections of pipe 42 to keep them aligned. Nylon straps 72 are attached to the metal strips 70 and sections of pipe 42. FIG. 16 also shows the threaded rods 50 inserted through the sections of pipe 42 at predetermined locations.

FIG. 17 is a side view of the back sidewall component 58 of the outer container 38. The back sidewall component 58 is composed of sections of plastic pipe 42 in vertical alignment. Strips of rubber gasket material 52 are sealed along the edges of the sections of the pipe 42. A metal frame 44 constructed of 90° metal angle portions 46 is attached to the outer surface of the sidewall along the edges of the plastic pipes 42. Holes 60 are cut into the frame 44 at selected locations through which screws 62 will be inserted. Also shown are the washers 64 and nuts 66 that provide the means by which the rods 50 connect the sidewalls 40 and 58.

FIGS. 18 is a cross sectional view of the pair of end panels 68 and bottom panel 74 of the outer container 38. The bottom panel 74 lays horizontal and the end panels 68 are raised into a vertical position.

FIG. 19 is a cross sectional view of the pair of end panels 68 and bottom panel 74 folded into a position for shipping and storage.

FIG. 20 is another view of the pair of end panels 68 and bottom panel 74 folded into a position for shipping and storage

FIG. 21 is a cross sectional view of the pair of end panels 68 and bottom panel 74 lying in a horizontal position.

FIG. 22 is an overhead view of the inner surface of the pair of end panels 68 and bottom panel 74 lying in a horizontal position. The figure shows the bottom panel 74 and the end panels 68 are attached together by straps 72. Strips of rubber 76 are sealed to the inner surface on the end sections of pipe of the bottom panel 74.

FIG. 23 is an overhead view of the outer surface of the pair of end panels 68 and bottom panel 74 lying in the horizontal position. The figure shows the pair of end panels 68 and bottom panel 74 have metal strips 70 sealed to them and are attached together by straps 72.

FIG. 24 is a cross sectional side view of the flood control barrier 30 composed of a base 26 anchored to the surface 20 by anchoring members 28 having outer containers 38 with empty inner containers 78 attached to the water inlet pipes 52. The empty inner containers 78 are flexible bladders 78 constructed of plastic. Detachable one-way flow control valves 80 are also shown attached to the water inlet pipes 52. The air vent pipes 54 through which the air exits the outer container 38 are also shown in this figure. Detachable one-way flow control valves 80 are also shown attached to the air vent pipes 54. The attached edge 82a of the skirt 82 attached to the base 26 in between the base 26 and outer container 38 is also shown. The pair of parallel pipes 84a and 84b is shown deposited at the outer edge of the skirt 82. Another section of pipe 84c connecting the pair of pipes 84a and 84b together is shown. A hold down container 86 for the pipes 84a and 84b is also shown. Sand 88 deposited in the bottom of the container 86 is also shown.

FIG. 25 is a cross sectional side view of the flood control barrier 30 composed of a base 26 anchored to the surface 20 by anchoring members 28 having outer containers 38 with the inner flexible bladders 78 that have been filled with floodwater 90. Also shown is the self filling process. The X arrow shows the flow of the floodwater into the flexible inner container 78. The pressure P_O of the floodwater outside the outer containers 38 is greater than the air pressure P_A within the containers 38 and forces the flow X of floodwater through the water inlet pipe 52 and detachable one-way flow control valve 80 into inner flexible bladder 78. The Y arrow shows the air in the container 38 being released through the air vent pipes 54 and detachable one-way flow control valves 80 to the

atmosphere out side the containers 38 as the inner flexible bladder 78 fill with floodwater.

As shown by the Z arrows as the inner bladders 78 fill with the floodwater the pressure inside P_I and outside P_O the containers equalize.

The water filled containers 38 provide weight in addition to the weight W_F of the foundation 22 to resist the hydrostatic forces of the rising floodwater. As shown previously the weight of structure of a given size can be easily calculated. In the figure shown if the height H_1 of the water in the bottom containers is 3 feet and the width is 1.5 ft and the length is 500 ft. the weight W_1 will be 143,392.5 lbs or 71.7 tons. If the height H_2 of the water in the top containers is 2 feet and the width is 1.5 ft and the length is 500 ft. the weight W_2 will be 95,595 lbs or 47.8 tons.

When the weight W_F of the foundation (105,154.5 pounds or 52.6 tons), the weight W_1 of the bottom containers (143,392.5 lbs or 71.7 tons) and the weight W_2 of the top containers (95,595 lbs or 47.8 tons) are added together the total or cumulative weight W_C holding back the hydrostatic forces of a 5 feet high 500 feet long floodwater is 344,142 lbs. or 172 tons. The weight will be greater when the weight of the empty containers is added to the above cumulative weight.

Also shown in the figure the attached edge 82b of the skirt 82 is attached to the base 26 and is deposited between the base 26 and the bottom edge of the front sidewall 40 of the container 38. The pipes 84a, 84b and 84c are deposited along the outer edge of the skirt 82 distal from the base 26. A self-filling container 86 is deposited on top of the pipes 84a and 84b. The self-filling container 86 is partially filled with sand 88. The skirt 82 is deposited over the surface 20 preventing the surface 20 in close proximity around to flood control barrier 30 from being saturated with water causing a loosening of the soil.

FIG. 26 is an overhead view of the flood control barrier 30 showing the containers 38 with the skirts 78, pipes 84a, 84b and 84c and containers 86 deposited in place. As shown the pipes 84a, 84b and 84c, and containers 86 are deposited along the unattached outer edges of the skirts 78 distal to the flood control barrier 30 to hold down the skirts 78 as the floodwater rises. An outline (shown by the dotted lines) of the surface area (W x L) of the foundation 22 is also shown. The surface area of the flood control barrier 30 shows the stability that the foundation 22 provides the flood control barrier 30.

FIG. 27 is an overhead view of the flood control barrier 30 showing the bases 26 and containers 38 deposited in an arrangement to form a flood control channel.

FIG. 28 is an overhead view of the flood control barrier 30 showing the bases 26 and containers 38 deposited in an arrangement to form an enclosure that protects a given area.

FIG. 29 is an overhead view of a 90° metal angle bracket 92 connecting two containers 38 positioned at right angle to one another. A first metal bracket 94 with 45° angle bend at each end is also shown connecting the two containers 38 on the same side near the top at the edges of the two containers 38. A second metal bracket 94 with 45° angle bend at

each end is also shown connecting the two containers **38** on the same side near the top at the edges of the two containers **38**.

FIG. 30 is a front view of a top metal bracket **94a** with a 45° angle bend at each end connecting two containers **38a** and **38c** positioned at right angle to one another. A bottom metal bracket **94b** with a 45° angle bend at each end connecting the two containers **38b** and **38d** positioned at right angle to one another is also shown.

FIG. 31 is an overhead view of flood control barrier **30** showing the bases **26** and containers **38** deposited in an arrangement to form an enclosure that contain liquids within. The flood control barrier **30** has a liner **96** deposited inside the enclosure that enables the flood control barrier **30** to be transformed into an above ground storage tank. The liner **96** being imperious to liquids is attached to the edge of the bases **26** similar to the attachment of the skirts **82**.